

GUJARAT TECHNOLOGICAL UNIVERSITY**M. E. - SEMESTER – I • EXAMINATION – WINTER 2012****Subject code: 712001N****Date: 08-01-2013****Subject Name: Advanced Structural Analysis****Time: 02.30 pm – 05.00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Develop Flexibility Matrix for the structure shown in Fig: 1 using Transformation Matrix by using M_A and R_{BA} as Redundant. **07**
 (b) Analyze the structure shown in Fig:1 by Flexibility Member Approach. **07**

- Q.2** Develop Flexibility Matrix and Analyze the structure shown in Fig:2 by Flexibility Member Approach. **14**

OR

- Q.2** Develop Flexibility Matrix and Analyze the structure shown in Fig:3 by Flexibility Member Approach. **14**

- Q.3** (a) Write Stiffness matrix for a space frame member with respect to its member axis. **07**
 (b) In a fixed beam of span 8 m has c/s of $2EI$ from Left support up to centre of span and has c/s of EI from centre of span to Right Support. The beam is subjected to 25 kN/m u.d.l up to 4m from Left support while a point load, 50 kN downward is acting at 6 m from Left support. 10 kN-m, Anti Clock Wise moment and a point load of 20 kN downward are acting at centre of span. Draw SF and BM diagram by analyzing the beam by stiffness member approach. **07**

OR

- Q.3** (a) Draw S.F and B.M diagram for the continuous beam by analyzing it by Stiffness Member Approach. Refer Fig.4. Consider that support B has a downward settlement of $200/EI$ and support C has downward settlement of $150/EI$. **07**
 (b) Draw S.F and B.M diagram for the continuous beam by analyzing it by Stiffness Member Approach. Refer Fig.5. Consider that beam has 25 degree C temperature at Top and 10 degree C temperature at bottom. Consider $I_{AB} = 2.5 \times 10^{-4} \text{ m}^4$, $I_{BC} = 4.5 \times 10^{-4} \text{ m}^4$, $d_{AB} = 0.45 \text{ m}$, $d_{BC} = 0.3 \text{ m}$, $E = 200 \times 10^6 \text{ kN/m}^2$ and $\alpha = 1.2 \times 10^{-5} / ^\circ\text{C}$ **07**

- Q.4** Find support reactions and member end actions in a plane truss shown in Fig.6 using stiffness member approach. Consider $AE = \text{constant}$ **14**

OR

- Q.4** (a) Generate Stiffness matrix – S and overall Joint Stiffness – S_j for the plane truss shown in fig.7, Consider $AE = \text{constant}$ **07**
 (b) Find out Support reactions for the plane truss of Q-4 (a) Refer Fig.7. Use Stiffness Member approach. **07**

- Q.5** Find support reactions and draw B.M diagram by analyzing the Plane Frame by Stiffness Member Approach. Refer Fig:8 . Consider $E=200 \times 10^6$ kN/m² , Moment of Inertia and c/s Area for member no. 1 & 2 as 0.5×10^{-3} m⁴ and 0.02 m² respectively, while Moment of Inertia and c/s Area for member no. 3 as 1.25×10^{-3} m⁴ and 0.03 m² respectively **14**

OR

- Q.5 (a)** Generate Overall Joint Stiffness matrix- S_j and Stiffness Matrix - S for the Grid shown in Fig:9 . Consider $I_{xx}= 2.9 \times 10^{-3}$ m⁴ , $G= 4.8 \times 10^6$ kN/ m² , $I_{yy}= 3.3 \times 10^{-3}$ m⁴ and $E= 1.5 \times 10^7$ kN/ m² **07**
- (b)** Generate Overall Joint Stiffness matrix- S_j and Stiffness Matrix - S for the Plane Frame shown in Fig:10 . Consider $I= 2.9 \times 10^{-3}$ m⁴ , $A= 0.05$ m² , and $E= 1.5 \times 10^7$ kN/ m² **07**

